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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,727	01/08/2002	Bowie G. Keefer	6454-61581	6441

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EXAMINER
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RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 04/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/043,727

Applicant(s)

KEEFER ET AL.

Examiner

Mark Ruthkosky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 2/15/2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-9,27-34,46,70-72,78 and 80-93 is/are pending in the application.
- 4a) Of the above claim(s) 27-34,46 and 91-93 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-9,70-72,78 and 81-90 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/15/2006 has been entered.

### ***Election/Restrictions***

Claims 27-34, 46 and 91-93 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 2/15/2005. Claims 91-31 are included as nonelected as the claims depend from nonelected claim 27.

### ***Claim Rejections - 35 USC § 112***

The rejection of claims 27-34, 46 and 80 are rejected under 35 U.S.C. 112, has been overcome by applicant's amendment.

***Claim Rejections - 35 USC § 102***

The rejection of claims 1, 2, 4-9, 70, 72 78 and 81-86 under 35 U.S.C. 102(e) as being anticipated by Singh et al., (US Patent. 5,686,196) has been overcome by applicant's amendment.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4-9, 70-72, 78 and 81-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et al. (US 5,686,196), in view of Hornburg (US 6,190,791.)

Singh et al. discloses a system for operating a fuel cell, which includes a solid oxide fuel cell, fuel storage containers, and an expander. The system includes both hydrogen and diesel fuel as fuel, and includes storage containers for both. The high-pressure reformed fuel is delivered to an expander, which depressurizes the reformed fuel for delivery to a conventional solid oxide fuel cell. (See column 4, lines 53-58.) Singh does not explicitly teach that the expander of the power plant system receives the fuel at the same pressure, as it is stored in the container. The reference teaches the hydrogen supply means supplies gas at about 10 atm. (claim 14.) The stored gas goes through a reforming process at as increased pressure of about 10-20 atm. The reformed hydrogen enters the expander from the hydrogen separator, from which the hydrogen

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exits at a relatively lower pressure than the reformat gas stream (see col. 4, lines 5-15.) From this, the pressure is considered to be substantially the same as the first pressure that is exits the storage container.

With regard to claim 6, the expander is coupled to pumps as shown in Fig. 1. With regard to claims 7, 8, and 78 the ambient atmosphere is a heat exchanger, which contains air as a working fluid. Since the atmosphere surrounds the system disclosed by Singh et al., heat will inevitably be transferred, at least in small amounts, from the atmosphere to the fuel in the fuel storage container. With regard to claims 81-86, the limitations “configured to” and “configured to make use of” are intended uses of the system. Hydrogen fuel is released from a fuel storage container, which generates mechanical power with regard to the release of the gas from the container (see col. 4, lines 45-62.) The system includes a fuel transport device and when the fuel is released from the container, the fuel is transferred along a pressure path to the various elements of the system. Although the reference does not describe these effects, the fuel being released provides the structure of the system claimed. As the fuel is transported into an expander, the pressure is lowered and the fuel expands isentropically in the closed system (see col. 4, lines 54-62.) The expander is mechanically coupled to a fuel cell, hydrogen storage tank, reformer, pumps and condenser as shown in Figure 1. As expanders are electrically powered systems, such as turbines, the expander will inherently be in communication with an electrical coupling.

Singh does not teach that the power plant system recovers energy from expansion of the fuel as pressure changes from the first pressure to the second pressure. Hornburg (US 6,190,791), however, teaches using an expander in a fuel cell, wherein the expander is coupled to

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a compressor of the fuel cell system to drive the compressor (see claim 10.) Thus, the system recovers energy from expansion of the fuel as pressure changes from the first pressure to the second pressure. It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the energy of expansion from the expander to drive the compressor systems of the power plant as the prior art teaches that this energy is sufficient to drive a compressor in a fuel cell system. One would be motivated to use this method taught in the prior art to conserve energy and lower costs. The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

With regard to claims 4, 5, 70 and 72, the hydrogen storage component of fuel storage may include a bed of hydrogen storage alloy as a gas sorbent, or a cryogenic storage system, (column 4, lines 15-36.) Various metal hydrides are noted. With regard to claim 74, Singh et al. do not specifically disclose the use of carbon material or zeolite as an adsorbent. Singh et al. teach purifying hydrogen prior to contact with hydrogen storage alloy, and as activated carbon is a well-known impurity adsorbent, it would have been obvious to one of ordinary skill in the art to include carbon in the hydrogen storage system taught by Singh et al. in order to remove impurities in the system, as suggested by Singh et al.

With regard to claims 87-89, the Singh reference does not disclose the expander to be a multi-stage expander, a positive displacement expander or an impulse turbine. As the Singh reference teaches an expander to receive a high-pressure gas and release the gas at a lower pressure in the same manner used in the present invention, it would be obvious to one of ordinary skill in the art at the time the invention was made to use any expander that will provide this function. As multi-stage expanders, positive displacement expanders and impulse turbines are

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well known in the art as expanders used for this purpose, one of ordinary skill in the art would use these expanders as the expander to receive a high-pressure gas and release the gas at a lower pressure to the fuel cell in the invention of Singh. The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claim 90 is rejected under 35 U.S.C. 103(a) as being unpatentable over Singh et al. (US 5,686,196), in view of Hornburg (US 6,190,791), and further in view of Hornburg (US 5,981,096.)

The applied references do not teach the expander to be coupled to a coolant pump. Hornburg et al. (US 5,981,096) teaches a system for operating a fuel cell that includes a fuel/coolant that is admitted to the anode of the fuel cell in order to cool the fuel cell. The coolant/fuel mixture is admitted by a pump that is incorporated into the system in a position that is equivalent to the position of the expander in the Singh reference, (figure, col. 3, lines 1-10.) It is further noted that the expander of Singh flows the fuel to the anode of the fuel cell in an equivalent manner. It would be obvious to one of ordinary skill in the art at the time the invention was made to couple a coolant pump to the expander as taught in Singh in order to pump coolant through the fuel cell as taught by Hornburg et al. (US 5,981,096.) It is further noted that Hornburg et al. (US 5,981,096) teaches an expander used for a different function that is coupled with an oxidant compressor. This provides motivation to the skilled artisan to couple two components on a common shaft (col. 3, lines 1-10.) The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

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***Response to Arguments***

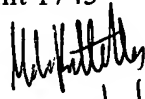
Applicant's arguments filed 9/19/2005 have been fully considered but they are not persuasive. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

***Examiner Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky  
Primary Patent Examiner  
Art Unit 1745

  
4/16/06